

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application of: Doni S. Dattani et al.
Serial No.: 10/619,531
Title: INTRA ESTIMATION CHROMA MODE 0 SUB-BLOCK
DEPENDENT PREDICTION
Filed: July 15, 2003
Attorney Docket No.: 03-0444 / 1496.00308
Examiner: Huber, J.
Art Unit: 2621
In Response To: Office Action mailed August 6, 2008

AMENDMENT AFTER FINAL

Mail Stop AF
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

DO NOT ENTER: /JH/

Sir:

In response to the Office Action mailed August 6, 2008,
please amend the above-identified application as follows:

AMENDMENTS TO THE CLAIMS

1. (CURRENTLY AMENDED) An apparatus comprising:

a first processing circuit configured to generate a plurality of reconstructed samples in response to a plurality of macroblocks of an input signal; and

5 a second processing circuit configured to (A) generate a plurality of sum values based on said reconstructed samples, said sum values being used in defining a plurality of formulas organized as a plurality of groups ~~prediction types based on a number of said sum values that are available~~ and (B) individually determine a
10 plurality of intra prediction DC predictors for each of a plurality of chroma sub-blocks respectively of a current macroblock, wherein (i) all of said intra prediction DC predictors are generated using said formulas in a first of said groups ~~prediction types~~ when all of said sum values are available; and (ii) both (a) ~~a first subset~~
15 one of said intra prediction DC predictors ~~is~~ are generated using a respective one of said formulas in a second of said groups ~~said first prediction type~~ and (b) a remainder ~~second subset~~ of said intra prediction DC predictors are generated using respective ones of said formulas in said first group ~~a second of said prediction~~
20 ~~types~~ when only a single one of said sum values is unavailable.

2. (ORIGINAL) The apparatus according to claim 1, wherein said second processing circuit is implemented in a decoding loop of an encoder.

3. (ORIGINAL) The apparatus according to claim 1, wherein said first and said second processing circuits comprise a decoder.

4. (ORIGINAL) The apparatus according to claim 1, wherein said apparatus comprises an H.264 compliant decoder.

5. (PREVIOUSLY PRESENTED) The apparatus according to claim 1, wherein said second processing circuit comprises:

5 a third processing circuit configured to generate an intra predicted chroma sub-block in response to one of said intra prediction DC predictors.

6. (ORIGINAL) The apparatus according to claim 5, wherein said second processing circuit further comprises:

5 a control circuit configured to generate said intra prediction DC predictor for each of said chroma sub-blocks in response to said reconstructed samples.

7. (ORIGINAL) The apparatus according to claim 6, wherein said control circuit is further configured to determine a position of a top edge and a left edge of a chroma block of said current macroblock.

8. (PREVIOUSLY PRESENTED) The apparatus according to claim 7, wherein said reconstructed samples comprise a plurality of reconstructed samples in a row adjacent to said top edge of said chroma block.

9. (PREVIOUSLY PRESENTED) The apparatus according to claim 7, wherein said reconstructed samples further comprise a plurality of reconstructed samples in a column adjacent to said left edge of said chroma block.

10. (CANCELED).

11. (CANCELED).

12. (CURRENTLY AMENDED) An apparatus comprising:

means for generating a plurality of reconstructed samples in response to a plurality of macroblocks of an input signal; and

means for (A) generate a plurality of sum values based on

5 said reconstructed samples, said sum values being used in defining

a plurality of formulas organized as a plurality of groups
~~prediction types based on a number of said sum values that are~~
~~available~~ and (B) individually determining a plurality of intra
prediction chroma mode 0 predictors for each of a plurality of
10 chroma sub-blocks respectively of a current macroblock, wherein (i)
all of said intra prediction chroma mode 0 predictors are generated
using said formulas in a first of said groups ~~prediction types~~ when
all of said sum values are available; and (ii) both (a) ~~a first~~
~~subset of one~~ said intra prediction chroma mode 0 predictors is are
15 generated using a respective one of said formulas in a second of
said groups ~~said first prediction type~~ and (b) a remainder ~~second~~
~~subset~~ of said intra prediction chroma mode 0 predictors are
generated using respective ones of said formulas in said first
group ~~a second of said prediction types~~ when only a single one of
20 said sum values is unavailable.

13. (CURRENTLY AMENDED) A method for intra prediction of
a chroma block comprising the steps of:

(A) generating a plurality of reconstructed samples in
response to a plurality of macroblocks of an input signal;

5 (B) generating a plurality of sum values based on said
reconstructed samples, said sum values being used in ~~defining~~ a
plurality of formulas organized as a plurality of groups ~~prediction~~
~~types based on a number of said sum values that are available;~~

(C) determining a plurality of intra prediction chroma mode 0 predictors for each of a plurality of chroma sub-blocks respectively of a current macroblock individually, wherein (i) all of said chroma mode 0 predictors are generated using said formulas in a first of said groups ~~prediction types~~ when all of said sum values are available; and (ii) both (a) ~~a first subset one~~ of said intra prediction chroma mode 0 predictors ~~is are~~ generated using a respective one of said formulas in a second of said groups ~~said first prediction type~~ and (b) a remainder ~~second subset~~ of said intra prediction chroma mode 0 predictors are generated using respective ones of said formulas in said first group ~~a second of said prediction types~~ when only a single one of said sum values is unavailable; and

(D) generating a compressed and encoded video bit stream using said intra prediction chroma mode 0 predictors to reduce spatial redundancy.

14. (CANCELED).

15. (CURRENTLY AMENDED) The method according to claim 13, wherein each of said formulas ~~prediction types~~ used to generate each of said intra prediction chroma mode 0 predictors is selected independently in response to availability of said reconstructed samples adjacent to said chroma block.

16. (ORIGINAL) The method according to claim 13, further comprising:

generating said reconstructed samples by inverse quantizing and inverse transforming a compressed bitstream.

17. (CURRENTLY AMENDED) The method according to claim 23, further comprising:

generating all of said intra prediction chroma mode 0 predictors using said formulas in a fourth of said groups
5 ~~prediction types~~ when none of said sum values are available, ~~wherein said prediction types comprise at most four of said prediction types.~~

18. (CURRENTLY AMENDED) The method according to claim 17, wherein all of said formulas in said fourth group ~~third prediction type~~ comprises a median chroma value.

19. (CANCELED).

20. (PREVIOUSLY PRESENTED) The method according to claim 13, wherein each of said intra prediction chroma mode 0 predictors comprises a weighted average of one or more of said sum values.

21. (CURRENTLY AMENDED) The apparatus according to claim 1, wherein said second processing circuit is further configured to generate all of (i) ~~a third-subset one~~ a respective one of said formulas in said first group said first prediction type, (ii) ~~a fourth-subset two~~ respective ones of said formulas in said second group said second prediction type and (iii) a ~~remainder~~ fifth-subset of said intra prediction DC predictors using said formulas in a third of said groups prediction types when only two of said sum values are unavailable.

22. (CURRENTLY AMENDED) The apparatus according to claim 1, wherein said second processing circuit is further configured to generate a signal carrying mode information that identifies said formulas ~~prediction types~~ used to generate said intra prediction DC predictors, said apparatus further comprising an encoder configured to generate a compressed and encoded video bit stream incorporating said mode information.

23. (CURRENTLY AMENDED) The method according to claim 13, further comprising:

generating all of (i) ~~a third-subset one~~ a respective one of said intra prediction chroma mode 0 predictors using a respective one of said formulas in said first group ~~said first prediction type~~, (ii) ~~a~~

~~fourth subset two~~ of said intra prediction chroma mode 0 predictors using respective ones of said formulas in said second group ~~said second prediction type~~ and (iii) a remainder ~~fifth subset~~ of said intra prediction chroma mode 0 predictors using said formulas in a third of said groups ~~prediction types~~ when only two of said sum values are unavailable.

24. (CURRENTLY AMENDED) The method according to claim 13, further comprising the step of:

generating a signal carrying mode information that identifies said formulas ~~prediction types~~ used to generate said intra prediction chroma mode 0 predictors, wherein said compressed and encoded bit stream incorporates said mode information.

R E M A R K S

Careful review and examination of the subject application are noted and appreciated.

SUPPORT FOR CLAIM AMENDMENTS

Support for the amendments to claims may be found in the specification, for example, on page 32 lines 1-10. As such, no new matter has been added.

CLAIM REJECTIONS UNDER 35 U.S.C. §112

The rejection of claims 1-9, 12, 13, 15-18 and 20-24 under 35 U.S.C. §112, first paragraph, has been obviated by amendment and should be withdrawn.

The rejection of claims 21 and 23 under 35 U.S.C. §112, second paragraph, is respectfully traversed and should be withdrawn.

Given a set of any four elements {W, X, Y, Z}, more than four subsets may be created. For example, some possible subsets of the set {W, X, Y, Z} include a subset {W}, a subset {X}, a subset {Y}, a subset {Z}, a subset {W, X}, a subset {W, Y}, a subset {W, Z} and so on. As such, the rationale used in the rejection is incorrect and the rejection should be withdrawn.

CLAIM REJECTIONS UNDER 35 U.S.C. §103

The rejection of claims 1, 2, 5-9, 12, 13, 15, 16, 20, 22 and 24 under 35 U.S.C. §103(a) as being unpatentable over Sun, US Pub. No. 2003/0202705, (hereinafter Sun) in view of "Working Draft Number 2 Revision 2" (hereinafter WD2) has been obviated by amendment and should be withdrawn.

The rejection of claims 3 and 4 under 35 U.S.C. §103(a) as being unpatentable over Sun in view of WD2 and Joch et al., US Pub. No. 2004/0101059 (hereafter Joch) has been obviated by amendment and should be withdrawn.

Sun concerns a system and method for lossless video coding (title). WD2 concerns a reference coding method to be used for the development of a new video compression method called JVT Coding as ITU-T Recommendation (H.26L) and ISO/IEC JTC1 standard (MPEG-4, Part 10) (WD2 page 1). Joch concerns a low-complexity deblocking filter (title).

Claims 1, 12 and 13 are independently patentable over the cited references. Claim 1 provides that (i) all of the intra prediction DC predictors are generated using the formulas in a first of the groups when all of the sum values are available and (ii) both (a) one of the intra prediction DC predictors is generated using a respective one of the formulas in a second of the groups and (b) a remainder of the intra prediction DC predictors are generated using respective ones of the formulas in the first

group when only a single one of the sum values is unavailable. Claims 12 and 13 provide similar language. The Office Action asserts that WD2, and in particular page 33 section 4.4.1.3, mentions that:

... when one sample e.g. S2 is unavailable one subset A, B and D are predicted predicted [sic] with a prediction type that uses closest possible samples while the second subset, C, is predicted with a second prediction type that does not use the closest possible sample.

In contrast, no such suggestion appears to be present in WD2 and thus *prima facie* obviousness has not been established.

In particular, section 4.4.4.1.3 of WD2 only indicates how to deal with four specific situations. In the first situation, all of the sums S0, S1, S2 and S3 are inside a frame and thus are all available. In the second situation, only S0 and S1 are inside the frame and thus both S2 and S3 are unavailable. In the third situation, only S2 and S3 are inside the frame and thus both S0 and S1 are unavailable. In the fourth situation, all of S0, S1, S2 and S3 are outside the frame and thus all are not available. WD2 does not appear to contemplate a situation where only a single one of the sums, such as S2, is not available. Sun does not appear to cure the deficiency in WD2.

Furthermore, FIGURE 8 of WD2 indicates that if S2 is not available because it is outside the frame, then S3 cannot be available because it too will be outside the frame. Likewise, either S0 and S1 are both inside the frame or they are both outside

the frame. There is nothing in WD2 that would suggest that missing only a single one of the sums is possible. Sun does not appear to cure the deficiency of WD2. Therefore, Sun and WD2, alone or in combination, do not appear to render obvious that (i) all of the intra prediction DC predictors are generated using the formulas in a first of the groups when all of the sum values are available and (ii) both (a) one of the intra prediction DC predictors is generated using a respective one of the formulas in a second of the groups and (b) a remainder of the intra prediction DC predictors are generated using respective ones of the formulas in the first group when only a single one of the sum values is unavailable, as presently claimed. As such, the claimed invention is fully patentable over the cited references and the rejections should be withdrawn.

Claims 22 and 24 are independently patentable over the cited references. Claim 22 provides that the second processing circuit is configured to generate a signal carrying mode information that identifies the formulas used to generate the intra prediction DC predictors. Claim 24 provides similar language. The Office Action asserts that paragraphs 0043 and 0046 of Sun mention generating mode information. In contrast, the cited text of Sun actually mentions generating predictive information. Furthermore, FIG. 2 of Sun indicates that the predictive information (on line 212) is a motion prediction mode and motion vectors. Nothing in

Sun appears to indicate that the predictive information including anything that identifies the formulas used to generate intra prediction DC predictors. Furthermore, section 4.4.4.1.3 of WD2 states:

For chrominance prediction there is only one mode. **No information is therefore needed to be transmitted.** (Emphasis added)

The claimed mode information is in direct opposition to WD2. The claimed invention sends information where WD2 indicates that no information needs to be sent. Therefore, Sun and WD2, alone or in combination, do not appear to render obvious that the second processing circuit is configured to generate a signal carrying mode information that identifies the formulas used to generate the intra prediction DC predictors, as presently claimed. As such, claims 22 and 24 are fully patentable over the cited references and the rejections should be withdrawn.

Claims 2-9, 11, 15-18 and 20-24 depend, either directly or indirectly, from claims 1 or 13, which are now believed to be allowable. As such, the dependent claims are fully patentable over the cited references and the rejections should be withdrawn.

Accordingly, the present application is in condition for allowance. Early and favorable action by the Examiner is respectfully solicited.

The Examiner is respectfully invited to call the Applicants' representative between the hours of 9 a.m. and 5 p.m.

ET at 586-498-0670 should it be deemed beneficial to further advance prosecution of the application.

If any additional fees are due, please charge Deposit Account No. 12-2252.

Respectfully submitted,

CHRISTOPHER P. MAIORANA, P.C.

A handwritten signature in black ink, appearing to read "John J. Ignatowski", is written over a horizontal line.

John J. Ignatowski
Registration No. 36,555

Dated: October 6, 2008

c/o Lloyd Sadler
LSI Corporation

Docket No.: 03-044 / 1496.00308